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UNITED STATES DEPARTMENT OF AGRICULTURE
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PLANT QUARANTINE BRANCH
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Report on Personnel Training and Survey Results for the
Mediterranean Fruit Fly in Central America, Panama, and
British Honduras for the Period May 2 to July 12, 1956

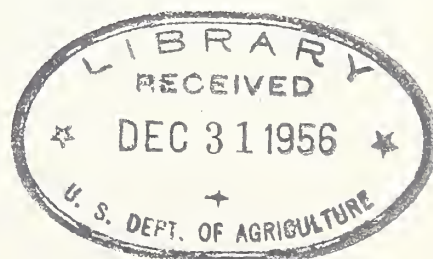
By R. G. Oakley, Jose Hidalgo, and James E. Mabry, Jr.

Introduction

Discovery of the Mediterranean fruit fly in Costa Rica in 1955 and recognition of the threat thus presented to member countries of "Organismo Internacional Regional de Sanidad Agropecuaria" led to a letter dated February 9, 1956 from Ing. Jose de Castro U., Director Ejecutivo of that organization, addressed to the Plant Quarantine Branch, Agricultural Research Service, United States Department of Agriculture, requesting assistance on the fruit fly problem. Specifically requested by Ing. Castro was a survey team that would serve a two-fold purpose (1) in aiding technical workers of Central America to become familiar with survey procedures and (2) in conducting a survey for possible presence of the fruit fly in the countries concerned outside of Costa Rica. The Branch welcomed the opportunity to participate, assigned the writers to the project and, with concurrence by officials of the British Colonial Administration, decided to incorporate British Honduras in the survey so as to encompass the whole of the Central American area. This account covers the ensuing operations of the survey party, beginning in Costa Rica on May 2 and ending in Guatemala on July 12, and also relates the activities of the other individuals participating in the training and survey program.

Survey Itinerary

May 2 - 11	In Costa Rica where initial training of eight participants and survey operations were conducted.
	The field survey was supplemented on May 21 - 25 by the senior writer.
May 13 - 25	In Panama
May 27 - June 7	In Nicaragua
June 8 - June 17	In Honduras
June 18 - June 27	In El Salvador
June 20 - June 29	In British Honduras (by the senior writer)
June 28 - July 12	In Guatemala



Specialists and Representatives of Central American
Countries and Panama Participating in Training
and Survey Procedures and Their Activities

For Costa Rica

Ing. Luis A. Salas, La Universidad de Costa Rica, conducted demonstrations in fruit fly bait preparation, trapping procedure, and in spray control operations for the benefit of the trainees. He also contributed much valuable information on the status of the Mediterranean fruit fly in Costa Rica, furnished laboratory space for the trainees, arranged transportation, and participated in the survey of Costa Rican localities not known to be infested with the subject pest.

Sr. Isaacs Solís of the Ministerio de Agricultura y Ganadería and under the direction of Ing. Salas participated in training and survey activities conducted in Costa Rica. Sr. Manuel Castillo also supplied assistance to the survey operations.

For Guatemala

Sr. Francisco Santizo of the Servicio Cooperativa Interamericano de Agricultura de Guatemala participated in training activities and survey procedure in Costa Rica, afterwards continuing with the survey party and assisting with its activities in Panama, Nicaragua, Honduras, El Salvador, and Guatemala.

Ing. Miguel Vasquez Grijalva of the Ministerio de Agricultura participated in training and survey operations in Costa Rica and afterwards participated in the survey of Guatemala.

Sr. Daniel Soto S. of the Ministerio de Agricultura assisted with the survey of Guatemala.

For Nicaragua

Sr. Francisco Estrada of the Servicio Técnico Agrícola Nacional participated in training and survey operations in Costa Rica, then assisted with the survey of Nicaragua.

Sr. Carlos Marín of the Ministerio de Agricultura y Ganadería participated in training and survey operations in Costa Rica, assisted with the survey of Nicaragua, then continued as a survey party participant in both Honduras and British Honduras.

For Honduras

Prof. Abraham Gunera of the Ministerio de Recursos Naturales participated in training and survey operations in Costa Rica, then assisted with the survey of Honduras.

Sr. Jose M. Mendez Lopez of the Ministerio de Recursos Naturales participated in training and survey operations in Costa Rica, then assisted with the survey of Honduras and El Salvador.

For El Salvador

Ing. Ruben Calderon of the Centro Nacional de Agronomia participated in training and survey operations of Costa Rica and assisted with the survey of El Salvador.

For Panama

Ing. Rhogelia Cuellar of the Ministerio de Agricultura y Ganaderia assisted with the survey of Panama part time.

For British Honduras

Mr. G. La Grenada, Agricultural Officer, assisted with the survey of parts of British Honduras.

Acknowledgment

Aside from the participating representatives cited above, to whom most generous thanks are extended, a host of individuals contributed materially towards progress in the survey, including especially the following; Ing. Castro of Organismo Internacional Regional de Sanidad Agropecuaria; Chiefs of Agricultural parties and their associates of International Cooperation Administration in all the capital cities; the Sr. Director General of Agricultura y Ganaderia, Dr. Harold Mowry, Dr. L. C. Kuitert, and staff members of Ing. Salas in Costa Rica; Prof. Isely in Panama; the Sr. Ministro of Agricultura y Ganaderia of Nicaragua; the Sr. Director of Agricultura of Honduras; the Sr. Director General of Agricultura of El Salvador; the Sr. Director General of Agricultura of Guatemala; Mr. John Bywater, American Consul, Mr. A. N. C. Thomas, Acting Director of Agriculture, and the Citrus Growers of Stann Creek of British Honduras; a large number of United Fruit Company representatives; and specialists of the Section of Insect Identification and Parasite Introduction, Entomology Research Branch, Agriculture Research Service. The writers are greatly indebted to all these and to many others as well for their kind cooperation and assistance.

Equipment Used in the Survey

Costa Rica. Two transportation units, fruit fly traps and bait, and laboratory facilities were furnished through joint efforts of the Ministerio de Agricultura y Ganaderia and the Universidad de Costa Rica. A third transportation unit was furnished on occasion by the Servicio Tecnica Interamericana Cooperativa Agricultura.

Panama. One transportation unit and operator were furnished by the Servicio Interamericano Cooperativa Agrícola de Panama. Taxi service was utilized for a three-day period.

Nicaragua. Two transportation units and operators were furnished by the Ministerio de Agricultura y Ganaderia and laboratory space by the Servicio Tecnico de Nicaragua.

Honduras. One transportation unit with operator was furnished on a full-time basis and a second such unit on a part-time basis by the Ministerio de Recursos Naturales. In addition, a transportation unit with operator was furnished for a period of one week at San Pedro Sula by the Servicio Tecnica Interamericana Cooperativa Agricultura and for a three day period at La Ceiba by Sr. Alejandro Ricardo of that same agency.

El Salvador. One transportation unit and operator were furnished by the Ministerio de Agricultura y Ganaderia and one by the Centro Nacional de Agronomia. Laboratory space was also supplied by the lastly named organization.

Guatemala. One transportation unit was furnished by the Ministerio de Agricultura and a second, with operator, by the Servicio Cooperativa Interamericano de Agricultura. Laboratory space was made available by both organizations.

British Honduras. One transportation unit was furnished by the International Cooperation Administration.

By way of supplementing the above, the fruit fly traps and bait used in the survey were supplied by the Plant Quarantine Branch except in Costa Rica where such equipment was provided by the country concerned. (Note: The traps and a supply of bait were left in each country surveyed with suggestions on their continued use in specific localities.)

Objectives of Survey Operations

The objectives of training and survey operations conducted in Central America and Panama were as follows:

1. To train representatives from countries outside Costa Rica in (a) field survey methods for detecting and measuring existing Mediterranean fruit fly populations, (b) importance of preventing introduction of the pest, and (c) control measures.
2. To survey localities not known to be infested with the Mediterranean fruit fly for the possible presence of that pest.

Procedure of Training and Survey Operations

Training procedure. Demonstrations were conducted, explanations made, and instructions issued to convey the following information to trainees at San Jose:

1. Life history stages of the Mediterranean fruit fly, its habits, and host fruits attacked, with emphasis on those preferred by adults for oviposition purposes.
2. World distribution and economic importance of the Mediterranean fruit fly.
3. Methods of spread and suggested measures of prevention.
4. Method of distinguishing larvae of secondary pests in fruit from those of the Mediterranean fruit fly; also method of separating larvae of native fruit flies from those of the Mediterranean fruit fly under field conditions.
5. Characteristics of fruit infested by larvae of the Mediterranean fruit fly, especially citrus fruit, under field conditions.
(Trainees were taken on field trips for instruction in this phase and to observe economic importance of the subject pest.)
6. Method of collecting fruit and rearing of larvae such fruit might contain to establish facts on infestation and to enable the species to be definitely identified from reared adults.
7. Importance of detecting presence of the Mediterranean fruit fly in incipient infestations and before destructive populations have had time to develop, with a view of possible eradication.
8. Method of bait preparation and procedure of using traps to aid surveys for presence of the Mediterranean fruit fly, as well as to use the traps for measuring population levels in infested localities.
9. Kind and value of sanitary measures which may be employed to reduce population levels.
10. Method of insecticide control.

In the final training stages the representatives were taken on field trips in Costa Rican localities not known to be infested with the Mediterranean fruit fly. On these trips they did survey work under supervision, learning the best known methods of examining fruit, how to make use of traps for survey purposes, and occasions when retaining fruit for rearing purposes was advisable.

Survey procedure. Representative properties in the vicinities of airports, communication centers, around towns, along main highways, and in principal fruit-growing areas, when found to bear mature host fruits of the Mediterranean fruit fly, were surveyed for presence of that pest by examination of the fruit for larvae. Traps with protein hydrolysate bait were also placed on properties where susceptible fruit was encountered and were revisited at later dates to determine the identity of insects attracted to them. Notes were kept of findings and also on the nature of host fruit conditions in all localities surveyed.

The survey procedure was planned to disclose possible infestations of the Mediterranean fruit fly in the properties surveyed as well as significant infestations of that pest in any locality visited. Time did not permit, however, a survey extensive enough to reveal incipient infestations that may occur on properties not visited. Several weeks of operations in each country would have been necessary to supply reasonable assurance that such infestations did not exist.

Localities Surveyed by Country

The following paragraphs list general localities surveyed only. Detailed lists of properties and localities surveyed are to be included in a supplement.

Costa Rica (Areas or localities not previously known to harbor infestations of the Mediterranean fruit fly)

San Ysidro General
Puntarenas
Esparta
Barranca
La Rieja

Guanacaste (Tallaran, Las Canas, Liberia, and Bagaces) and a few properties along the Pan American Highway
Limon

Panama and Canal Zone

Properties along the Pan American Highway from the Canal Zone to Capira and from Santiago to David
Balboa area
Panama City - Tocumen
Balboa - Gamboa Rd.

Summit and Gamboa
Colon and highway properties on road leading to Colon from Panama City
Divisa and Chitre
David - Boquete area
Almirante - Changuinola area

Puerto Armuelles

Citrus in abundance was found in Capira, Gamboa, and along the highway from Panama City to a point about 10 miles from Colon. Ripe mangoes were also seen in this area and in the Balboa-Panama City vicinity. Ripe jocote fruits were very common and in large quantities. At Puerto Armuelles citrus was encountered, as were crop remnants in the Boquete area.

Nicaragua

Pan American Highway from the
Costa Rican border to Honduras
Rivas
Jinotepe, La Concepcion, and
San Marcos area
San Marcos - Massaya Rd.

Granada
Leon and Chinandego
Juigalpa and Santo Tomas
Matagalpa
Managua vicinity to Las Conchitas
Bluefields

Host fruits surveyed included citrus in abundance in the general area of San Marcos, Jinotepe, and La Concepcion and also in Santa Tomas and Matagalpa. In addition citrus was examined in scattered sites elsewhere. Few ripe fruits were found on the road from Managua to Somoto and in the Leon-Chinandego area. In Bluefields only a few guavas, fruits of Malpighia sp., and a small amount of citrus were seen.

Honduras

Choluteca - Tegucigalpa Rd.
Tegucigalpa vicinity and San
Pedro
Zamorano
Guinope
Danli
Tegucigalpa - Juticalpa Rd.
Valle de Angeles

Zembrano
Tenamboa
Comayagua
Siquatepeque
La Esperanza
San Pedro Sula - La Lima - Progreso
Tela
La Ceiba

Tamara

Ripe host fruit available for examination on the Tegucigalpa-Choluteca Road was sparse. Elsewhere citrus fruits were commonly encountered in towns. Other fruits examined were mangoes, avocados, Casimiroa tetrameria (common), peaches, apples, roseapples, Malay apples, Surinam cherries, and a number of introduced fruits at Lancetilla.

El Salvador

Pan American Highway from La
Union (near Honduras) to Santa
Ana (near Guatemala)
La Union and San Miguel
San Salvador, Las Palmas, and
Balboa Park vicinities
Armenia - Sonsanate Rd.
Santa Tecla - La Libertad Rd.

Santa Ana - Ahuachapan Rd,
San Salvador - Colima - Chalatenango
Road
Zacatecoluca vicinity
Cojutepeque vicinity
Usulután - Santa Elena - Santiago
de Maria vicinities
Opico - Sitio del Ninos

Citrus fruit, consisting largely of well ripened oranges, was found in abundance in vicinities of Cojutepeque and San Salvador. It was found elsewhere in single or a few trees in several other localities as well. Additional hosts surveyed included roseapples (in abundance in Balboa Park near San Salvador), mangoes, avocados, and tropical almonds.

Guatemala

Pan American Highway from
Salvadoran Border to Guatemala
City and Solola
Guatemala City - Retalhuleu -
Champerico Rd.
Guatemala City - Sanarate Rd.

Guatemala City - Salama Rd,
Chichicastenango, Panajachel, Atitlan,
Tecpan, Antigua, San Juan, Santa
Jose, Tiquisate, Chimaltenango, and
Guatemala City vicinities

Ripe citrus fruit, consisting largely of oranges, was found in abundance in Guatemala City, Antigua, San Juan, Escuintla, Tiquisate, and Lake Atitlan vicinities, as well as in scattered plantings of small size or single trees in many other localities visited. Ripe peaches or plums, sometimes both, were also found in abundance at Panajachel, Santa Maria de Jesus, Antigua, Zaragosa, San Marcos, Chichicastenango, Tecpan, and Mixco. Scattered trees were seen elsewhere as well. Ripe mangoes were common at a number of places, as were roseapples in a few localities. Lesser abundant ripe host fruits surveyed were apples, pears, tropical almonds, guavas, coffee, etc.

British Honduras

Belize - Airport Road to 30-
mile mark in direction of
Corozal
Stann Creek vicinity (from
Middlesex to Stann Creek)

Rearing Creek - Cayo Road, vicinity
of Cayo, and Central Farm and
Succotz

Ripe fruits of mangoes and Spondias purpurea were common in the Cayo area and scattering guava with mango in abundance were encountered in the vicinity of Belize airport. In Stann Creek scattered trees of sour oranges, tangerines, malay apples, guavas, Surinam cherries, and mangoes with ripe fruit were surveyed. Most of the commercial citrus crop had been picked at the time of the survey. Hicaco plums and Governor's plums were seen on a few occasions, both in the market and in the field.

FIELD OBSERVATIONS AND RESULTS

Fruit Fly Findings

No new infestations of the Mediterranean fruit fly were disclosed during the survey except at La Rioja between Esparta and Puntarenas, Costa Rica where an incipient infestation in grapefruit was discovered. The area concerned normally produces its own fruit requirements and is well separated from the infestation center on the Meseta Central by a belt of mountainous terrain.

In addition to the above, it was of note that fruit infested with the Mediterranean fruit fly was purchased in the Limon market, reportedly originating in the Meseta Central, that fruit from the San Jose vicinity was observed in the public market at Liberia near the Nicaraguan border, and that a passenger from San Jose was seen disembarking from a plane at

Tegucigalpa with a bag of citrus fruit.

On the Meseta Central the fruit fly was observed especially damaging to grapefruit, sour oranges, mandarins, sweet oranges, peaches, and rose-apples. Near 100 percent infestations were seen in two small plantings of grapefruit and one of sour oranges, for example. Other fruits found infested by Ing. Luis A. Salas and Dr. L. C. Kuitert included coffee, mango, and star-apple.

Native fruit flies encountered during the survey included Anastrepha mombinpraeoptans Sein abundantly infesting mango and "jocote" (Spondias purpurea) where ripe fruits were found in all the countries surveyed, except in British Honduras where mango infestations were sparse and in parts of Guatemala where A. ludens (Lw.) (Mexican fruit fly) seemed to dominate; Anastrepha sp. (A. mombinpraeoptans in one case at least) effecting minor infestations of citrus in Panama, Costa Rica, Nicaragua, and Honduras; A. striata Schiner in all the countries infesting guava; A. ludens in Stann Creek, British Honduras, in Tamara, Honduras, and generally in Guatemala infesting citrus in destructive numbers, but in lesser numbers in El Salvador and Nicaragua; and A. serpentina (Wied.) in sapote and more minor fruits.

Mediterranean Fruit Fly Host Conditions in the Central American Area

At least 80 proven or possible hosts of the fruit fly were encountered during the course of the survey. Still additional species were likely met with and not recognized as such in the absence of fruit. Of the group identified the most significant, from the viewpoint of their widespread distribution, host abundance, and preference, population maintenance, and spread of the fruit fly, are listed in the following discussion:

Apple or "Manzano" (Malus sylvestris) was a common fruit in the Guatemala highlands, as well as in La Esperanza, Honduras.

Avocado or "Aguacate" (Persea americana) commonly occurs in dooryard or small commercial plantings in all the populated areas visited. The fruiting season varies by country and locality, although ripe fruit was seen in every country during the course of the survey.

Cashew or "Maranon" (Anacardium occidentale) was a frequently seen host in all the countries and in especially large numbers in areas of lesser rainfall, such as in Pacific slope localities of Costa Rica, Nicaragua, El Salvador, and Guatemala.

Citrus trees of one variety or another were either common or abundant in every populated area visited and ripe fruits were generally found. In addition to dooryard plantings in endless numbers containing a few trees or more and up to an acre or more in size, as is typical of many towns, extensive cultivated acreages were observed, for example, in Capira-Boquete

vicinities of Panama, Meseta Central of Costa Rica (possibly 6,000 acres), San Marcos - La Concepcion area of Nicaragua, La Ceiba and San Pedro Sula areas of Honduras (4,000 - 5,000 acres), Stann Creek, British Honduras (5,300 acres), Cojutepeque, El Salvador, and Antigua - Escuintla vicinities of Guatemala. The varieties include oranges, grapefruit, tangerine - mandarin group, sour oranges, sweet limes, pomelo, calamondin, etc., and various crosses. The citrus crop of a year apparently lasts mostly from February through June or longer in some places, except in British Honduras. The relatively soft-skinned type of citrus common to such areas as Capira and Boquete of Panama, the San Marcos area of Nicaragua, the Cojutepeque locality of El Salvador and the Guinope vicinity of Honduras suggests that the fruit fly, if introduced, will possibly make the production of citrus doubtfully profitable in those production centers.

Coco-plum or "Icaco" (Chrysobalanus icaco) is abundant in many sections of the Central American area, especially in beach areas. It was also observed in dooryard plantings.

Coffee or "Cafe" (Coffea arabica) is planted in tremendous acreages in Costa Rica, Nicaragua, El Salvador, and Guatemala.

Guava or "Guayaba" (Psidium guajava) is one of the most common plants of the Central American area, and is to be found in dooryard plantings, growing wild in the mountains and in pastures, and even along the roadsides in small clearings of the pine country of Honduras. Ripe fruit of the wild variety was sparse during the survey except in Liberia, Costa Rica where many hundreds of acres of large trees in heavy production were seen. Cultivated species of Psidium appear at intervals in the dooryard plantings of "guava".

Loquat or "Ciruela japones" (Eriobotrya japonica) was frequently seen in dooryard plantings in many towns, although no ripe fruit was observed.

Malay-apple or "Manzana de Agua" (Eugenia malaccensis) was occasionally encountered in dooryards of all the countries of the Central American area.

Mamey apple or "Mamey" (Mammea americana) was a frequently encountered fruit tree in all the countries, but especially in the coffee region of Nicaragua where it is widely used as a windbreak.

Mango (Mangifera indica) trees form part of the landscape of most every vicinity from plantings in dooryards, parks, and roadside trees to windbreaks up to a mile or more in length, as in Nicaragua, for example. The season of fruit maturity varies by country and locality.

Papaya or "Papayo" (Carica papaya) is a common dooryard plant in all countries of the Central America area.

Peach or "Durazno" (Prunus persica) was observed in abundance at La Esperanza, Honduras and over a widespread area in the highlands of Guatemala.

Pear or "Pera" (Pyrus communis) was commonly observed in the highlands of Guatemala. A few trees were also encountered in Honduras.

Plum or "Ciruela" (Prunus domestica) is abundantly cultivated in the Guatemala highlands.

Pomegranate or "Granada" (Punica granatum) was frequently seen in dooryard plantings of El Salvador and Guatemala.

Roseapple or "Manzana de Rosa" (Eugenia jambos) inhabits all the countries of the Central American area, near forests of them showing up on occasions. They were also seen used as windbreaks in Costa Rica and Nicaragua. Its fruiting season varies with the locality.

Sapodilla or "Nispero" (Achras zapota) is represented in a large percentage of dooryard fruit plantings throughout the Central American area.

Soursop or "Guaynabano" (Annona muricata) is also a frequently encountered item in most parts of the Central American area, as are other Annona spp.

Spondias lutea or "Jobo" occurs as scattered trees in a wild state through the lowlands of the Central American area, except in the more arid sections.

Spondias purpurea or "Jocote" was considered the most abundant of all the fruit trees encountered. It occurs commonly in a wild state under both arid and more favorable rainfall conditions, as well as being the most abundant dooryard tree observed. It is also to be seen in countless numbers as living fence posts, especially in Costa Rica and Panama.

Star-apple or "Caimito" (Chrysophyllum cainito) is another shade of fruit tree common to most all the populated sections of the Central American area. It is seldom that one can travel far without seeing the species. Much of its fruit clings to the branches for a long period after once ripening, thus avoiding consumption.

Surinam Cherry or "Pitanga" (Eugenia uniflora) was occasionally encountered in dooryard plantings.

Sapote or "Zapote" (Calocarpum sapota) is a widespread and commonly seen fruit tree in the Central American area, especially in the coffee sections. A related species (C. viride or "Injerto") was often seen in Honduras and Guatemala.

Thevetia sp. is common in dooryard plantings, although not in large numbers, throughout much of the Central American area.

Tropical almond or "Almendra" (Terminalia catappa) is a common shade tree, especially in areas of lesser rainfall, in all the countries and was seen by the hundreds on occasions.

Woolyleaf white-sapote or "Matasano" (Casimiroa tetrameria) (possibly also including C. edulis in some cases) was seen to be a most abundant fruit tree in Honduras and Guatemala and to a lesser extent elsewhere,

An unidentified fruit producing tree was seen in abundance in the scrub of the thinly populated area to the north of Lake Nicaragua. It could possibly aid the thinly scattered Spondias and mango trees in that area in producing significant fruit fly populations. This same situation also possibly applies to many other wild host fruit trees in uncleared areas of the Central American section.

Training Results

On the whole, reaction by the representatives of the several countries to training and experience gained during the survey was very favorable. Those most interested, which included the majority, soon learned after training was initiated that extensive details were associated with survey procedure, consequently they applied themselves in a genuine and commendable manner, freely contributing their personal time for the purpose. By so doing, they eventually acquired practical knowledge of (1) field procedures in trapping and bait preparation; (2) fruit examination technique; (3) selection of favorable sites and scouting of individual properties; (4) fruit fly host preferences; (5) rearing techniques; (6) useful characters in distinguishing larvae of scavengers from those of fruit flies, as well as a method of separating larvae of native fruit flies from those of the Mediterranean fruit fly; (7) sharper field observation practices, etc. Once this end result was achieved those concerned shared in the volume of work accomplished, thus making a more thorough survey in most countries possible, besides demonstrating that they could and would continue survey practices as opportunity afforded. There was also evidence in the work participation that credit was due those responsible for originally making the personnel selections.

Prospects and Possible Means of Mediterranean Fruit Fly Spread

The Mediterranean fruit fly is subject to being spread from Costa Rica (also from other foreign localities in certain cases herein cited) to neighboring countries by the following means:

1. By infested fruit carried in baggage of passengers on planes and ships, or in vehicles, transiting Central America. This means of spread is likely the most dangerous one of the several to be considered, yet the prospect can be reduced to a minimum with adequate precautions being taken at airports and other points of entry.

2. By commercial fruit importations. This prospect, however, presents minimum danger, considering there may be little inter-country movement of fruit. Fresh fruit was seen in Honduras after its importation from El Salvador in one case; also in San Salvador, reportedly from Guatemala.
3. In soil with plants having originated on a recent date from underneath infested fruit trees.
4. By stowaway flies on airplanes. The Costa Rican airport near San Jose is adjacent to plantings of citrus and coffee, hence adults may fly aboard parked airplanes and later be flown to the next port of call where an exit can be effected.
5. By natural spread, both by wind currents and by flight habits of adults. Spread from Costa Rica to Panama and Nicaragua seems inevitable in view of an abundance of host plants in the border and other adjacent areas. Conditions along the Nicaraguan border, however, appear to lend themselves to practical prevention of such spread.

RECOMMENDATIONS

1. That continuing surveys for the Mediterranean fruit fly be conducted in each country concerned, especially in principal communication centers, including Panama City and David, R. P.; Managua, San Marcos, and Rivas, Nicaragua; Tegucigalpa and San Pedro Sula, Honduras; La Union, Cojutepeque, Santa Tecla, and San Salvador, El Salvador; Stann Creek and Belize, British Honduras; and Guatemala City, Escuintla, Antigua, San Lucas, and Panajachel, Guatemala, in order that any existing incipient infestations may be discovered before they have time to spread.
2. That each country concerned be prepared to take prompt suppressive measures against any incipient infestations of Mediterranean fruit fly that might be discovered within its borders. A small supply of bait and insecticides could thus be advantageously kept on hand for such an emergency. If such action is not taken promptly, an infestation may progress to a point where eradication, even if possible, would be considerably more difficult and costly.
3. That each country not now doing so sponsor further formal education and training in the field of entomology and plant quarantine enforcement for a few students every year.
4. That each country concerned conduct an educational campaign for the benefit of Customs inspectors engaged in the examination of imported products, including passengers' baggage, for the purpose of familiarizing them with facts about the Mediterranean fruit fly so that they may thus understand a single imported fruit could

expose fruit growers to sever losses, besides increasing the consumer cost of fruit.

5. That each country now engaged in plant quarantine enforcement practices review its method of operations and survey possible avenues for the entrance of foreign insects, then taking corrective action if needed. The stationing of employees most cognizant of the value of plant quarantine protection, at least in more important traffic centers, could pay good dividends, not only in protection against the Mediterranean fruit fly, but also against many other destructive plant pests.
6. That each country not now practicing plant quarantine enforcement enact necessary legislation and issue regulations authorizing regulated entry of plants and plant products from foreign sources. (paragraphs 4 and 5 would then apply)
7. That each country concerned prohibit the entry of fresh untreated fruits from Mediterranean fruit fly countries as well as other sources where dangerous insects inhabit fruits. Suitable incineration facilities should be provided at ports of entry to assure that unauthorized fruit is safely disposed of.
8. It is strongly recommended that OIRSA consider sending a representative to Florida to observe eradication measures being taken against the Mediterranean fruit fly. This will afford an excellent opportunity to see at first hand the operation of quarantine measures to prevent the spread of the pest and the employment of newly developed procedures and techniques to eliminate it from the area.
9. The destructive nature of the Mexican fruit fly encountered in Guatemala suggests that country might find it advantageous to send a representative to the Mexican Fruit Fly Laboratory in Mexico City for a period of observations on methods of control.

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James E. Mabry, Jr.

October 1, 1956

